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AIRPHOTO INTERPRETATION OF ENGINEERING SOILS OF INTERSTATE HIGHWAY ROUTE I-65 IN MARION, JOHNSON, SHELBY AND BARTHOLOMEW COUNTIES, INDIANA

MARCH 1965

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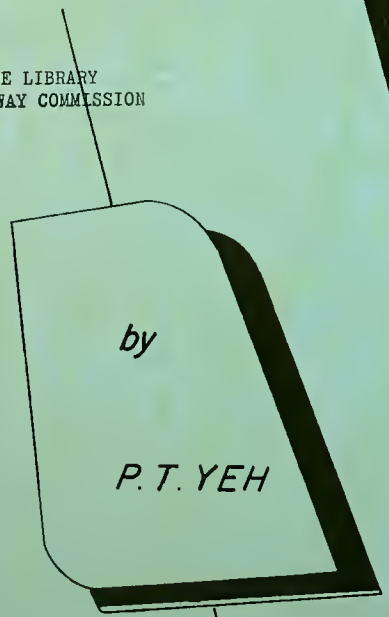

by

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AIRPHOTO INTERPRETATION OF ENGINEERING SOILS OF INTERSTATE HIGHWAY ROUTE 65: MARION, JOHNSON, SHELBY AND BARTHOLOMEW COUNTIES, INDIANA

By
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Joint Highway Research Project

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Joint Highway Research Project
Engineering Experiment Station
Purdue University

in cooperation with

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and the

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and the

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Purdue University
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March 25, 1965

FINAL REPORT

AIRPHOTO INTERPRETATION OF ENGINEERING SOILS

INTERSTATE ROUTE I-65: MARION, JOHNSON, SHELBY AND BARTHOLOMEW COUNTIES, INDIANA

TO: K. B. Woods, Director
Joint Highway Research Project

March 25, 1965

File: 1-5-3
Project: C-36-51E

FROM: H. L. Michael, Associate Director
Joint Highway Research Project

The attached report entitled "Airphoto Interpretation of Engineering Soils of I-65: Marion, Johnson, Shelby and Bartholomew Counties, Indiana," completes a portion of the project concerned with engineering soils mapping of the Interstate system from aerial photographs. This project was prepared as a part of an investigation conducted by Joint Highway Research Project in cooperation with the Indiana State Highway Commission, the Soil Conservation Service and the Bureau of Public Roads. The report was prepared by P. T. Yeh, Research Engineer, Joint Highway Research Project.

The soil mapping of I-65 between U.S. 52 and Taylorsville was done entirely by airphoto interpretation technique. To increase the value, the soil strip map was prepared on a photographic base with annotation to show soil areas. The generalized soil profiles were prepared from the available literature.

Respectfully submitted,

H. L. Michael
Associate Director

HLM:pm

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AIRPHOTO INTERPRETATION OF ENGINEERING SOILS

INTERSTATE ROUTE I-65, MARION, JOHNSON, SHELBY AND BARTHOLOMEW COUNTIES, INDIANA

INTRODUCTION

This report and series of photographic strip maps represents the airphoto interpretation of engineering soils for the section of Interstate 65 in Marion, Johnson, Shelby and Bartholomew Counites, Indiana. The proposed route extends from the northwest part of Marion County southward through the city of Indianapolis to the completed section of I-65 west of Taylorsville in Bartholomew County.

Unrectified aerial photographs of a sclae of 1/20,000 obtained in the summer of 1941 by the United States Department of Agriculture were used in this study. The reader should be aware of the fact that many cultural or surface features in the area have changed since the aerial photography was taken.

The aerial photographic strip map is presented in a mosaic at an approximate scale of one inch representing 1,500 feet (1/18,000). Since unrectified aerial photographs were used, the aerial mosaic may not be matched perfectly from one to the other.

The engineering soil maps were prepared by airphoto interpretation methods. The procedures used were similar to those employed in county mapping projects previously completed by the staff of the Joint Highway Research Project (1)*. No field checks and no soil explorations were made for this mapping study. However, available literature concerning this area was searched and used to complement the interpretation (2).

Reference was made to the agricultural soil surveys for Johnson County (3) and Bartholomew County (4) and the Formation, Distribution and Engineering Characteristics of Soil (5).

DESCRIPTION OF AREA

General

The area of interest along the proposed route of I-65 starts at the intersection with U.S. 52 about six miles northwest of the Monument Circle, Indianapolis, Indiana. The centerline of the route extends southeasterly across White River and Fall Creek. The route crosses and by-passes the business district on the east then proceeds southeasterly toward Johnson County, Shelby County and Bartholomew County. The route intersects I-465 south of Beech Grove and bypasses Southport, Greenwood and Franklin on the east. The route heads south after crossing Big Blue River in Shelby County and bypasses Edinburg and Camp Atterbury on the east. The route then swings to a southwesterly direction to bypass Taylorsville and connects with the completed section of I-65 about one mile west of Taylorsville and about seven miles north of Columbus, Indiana. This strip is about three miles wide and approximately 45 miles long.

Physiography

The entire area of interest is situated in the Central Till Plains Section of the Central Lowland Province of the United States (6, 8). The

* Figures in parentheses refer to references appearing in the bibliography.

northern three fifths of the area of study is located on the Tipton Till Plain of Indiana and the southern portion is situated on the Scottsburg Lowland of Indiana (6).

On the local basis, several end moraines of the Bloomington and Champaign Morainic Systems occur as local ridges in the Tipton Till Plain section and two large glaciofluvial, outwash plains are found near both ends of the study area.

Topography

The overall topography of the study area is a gently undulating plain dissected by several broad drainage channels. Locally, however, the topography varies from a nearly level surface to knolls and ridges rising as much as 30 feet above the surrounding ground surface. Undulating to rolling topography with local relief about 20 feet is found in the ridge moraine. In the ground morainic area, local relief is usually less than 10 feet. The maximum local relief of 100 feet is found on a kame north of the proposed route within Crown Hill Cemetry. Another high relief feature with a magnitude of 70 feet is found on the ridge along Driftwood River west of Taylorsville.

The ground surface at the northern end of the route is at an elevation of about 780 feet above sea level. The altitude gradually decreases to less than 700 feet at the White River crossing. It reaches its maximum elevation of 850 feet east of Greenwood in Johnson County. The altitude of the proposed route decreases again toward the south to an elevation of about 660 feet near Taylorsville.

Geology

The surface materials of the study area are chiefly the result of glacial deposition. Wind and water action, however, has modified some

of the deposits to a considerable extent. The thickness of the glacial deposit varies from a few feet at some places in the western part of Bartholomew County to over 200 feet in Marion County. Therefore, the bedrock geology is of academic interest only. No rock explosure is known or expected to occur along the route.

The underlying bedrocks are primarily of Devonian Age. At the south end of the route and to the west of the actual location a small area of Mississippian rocks are mapped. Limestones, dolomites and shales are expected at depth within the area of survey.

The unconsolidates surficial materials were deposited by several different glacial periods. At the southern end and west of Driftwood River the bedrock is covered by glacial drift of the Illinoian period (6). Wayne classifies it as the Butlerville Till Member of the Jessup Formation (7). The remained area is in the Tipton Till Plain section and the unconsolidated materials were by at least three different substages during the Wisconsin glacial period. Wayne includes all of these glacial drifts in the Cartersburg Till Member of the Trafalgar Formation (7). A number of ridges or end moraines decorate the relatively flat surface of the study area. Those ridges occurring in the southeastern portion of Johnson County and in the eastern part of Bartholomew County are from the Shelbyville and Champaign Morainic Systems. Those at the northern part of Johnson County near Greenwood and extending north to the southern part of Marion County are ridge moraines of the Bloomington Morainic System (6). The glacial drift material is composed of unstratified boulder, gravel, sand, silt and clay. In some areas, particularly those near the southern portion of the study area, a thin loess mantle or sand blanket was deposited by wind.

Extensive glaciofluvial outwash deposits were formed along White River, Sugar Creek, Big Blue River and Driftwood River. Most of the outwash material is a stratified coarse to medium textured sand and gravel. However, sandy-textured outwash may be found on the outwash plain at the southern end of the project.

Fluvial deposits occupy considerable area along the major drainage channels in the study area. Alluvial plains of more than one mile in width are found at slightly lower elevations on the large outwash plains.

Lacustrine deposits also occur near the southern tip of the study area. These deposits are composed chiefly of silt and clay formed during the Illinoian period.

Climate

The study area is situated in a continental, humid and temperate belt. It is characterized by rather warm humid summers and moderately cold winters. The variation of temperatures are wide and sudden change in temperature is not uncommon. The absolute temperature in this study area varies from -27°F to 111°F. The extremes of temperatures, however, are usually of short duration. The average annual precipitation ranges from 40 inches in the north to 45 inches at the south (2, 4).

LAND FORMS AND ENGINEERING SOIL AREAS

Engineering soils along the proposed route of I-65 vary from a coarse textured gravel and sand to a fine textured silty clay. Variations in the soil profiles generally are accompanied by changes of land form and topography.

Twenty-one soil areas are differentiated and numbered as such on the engineering soil strip maps attached. The soil areas on the maps

generally designate land forms such as ground moraines (Area 1, 2, 3 and 4), ridge moraines (Area 5, 6, 7, 8 and 9), sand dune (Area 10), outwash plains (Area 11, 12, 13 and 14), lacustrine plain (Area 15), terrace (Area 16), alluvial plain (Area 17 and 18), depression (Area 19 and 21) and eskers or kames (Area 20). Because of significant topographic differences within certain land form areas, a total of 21 soil profiles are portrayed. The profiles are believed to be representative of soil conditions expected along the proposed route.

The discussion that follows is a brief description of each soil area portrayed on the aerial photographic strip maps.

Area No 1. Ground Moraine of Wisconsin Age

The proposed route lies mainly on this ground moraine deposit (Area no. 1 on the maps). It is a late Wisconsin glacial drift deposit. This ground moraine extends from the northern tip of the area to an area about two miles north of the Bartholomew County line. It has a very gently undulating topography (local relief usually less than 10 feet).

The topsoil in this soil region varies from a silt loam to a silty clay loam on the high topographic position to an organic silty clay or clay in the low portion. The subsoils ranges from silty clay to clay. The parent material is a Wisconsin age till that varies from a loam to a clay loam in texture.

Area No. 2. Ground Moraine of Wisconsin Age

These ground moraine deposits are expected to be more sandy in texture than Area No 1. The deposits are scattered widely in Marion and Johnson Counties. One stretch is located near Crooked Creek west of White River. The others are scattered between Lick Creek in Marion

County and Heck Ditch in Johnson County. The surface of this area is gently undulating. Surface drainage systems are poorly developed because of generally good internal drainage. In the northern section some infiltration basins are evidence of the generally well drained character.

The topsoil of this region varies from a sandy loam to a sandy silt loam in the high ground to a sandy clay or silty clay in the depression. Silty clay loam to clay loam are the expected subsoils in the high positions and clay subsoils generally in the low position. The parent materials range from a sandy loam to a silty clay loam.

Area No. 3. Ground Moraine of Illinoian Age

Near the southern tip of the study area, there is a ground moraine of Illinoian drift. It is located on the west bank of the Driftwood River and is not traversed by the proposed route. It is a highly dissected plain with local relief of about 20 feet.

The surface soil is very silty in texture and is probably loess. It varies from a silt loam to a silty clay loam. Silty clay to clay textures occur in the subsoil. The clay loam parent material is found at depths of 10 to 15 feet. Interbedded sandstone and shale may be found at depths greater than four feet from the surface and underlying the glacial drift.

Area No. 4. Thin Sand on Ground Moraine

The deposit mapped as Area 4 shows evidence of a thin sand layer on ground moraine. This deposit is rather limited in area and is located immediately south of the Shelby County border in Bartholomew County. This region has a slightly undulating topography. The sand

deposit is expected to be less than 18 inches to 24 inches thick overlying the early Wisconsin drift deposit.

On the high position fine sandy loam to loam may be found in the topsoil. It is followed by a loam and a clay loam in the subsoil and grades into clay as the depths increase. The parent material varies from loam to clay. In the depressions an organic silt loam or an organic silty clay is found as the topsoil. The amount of organic matter decreases but the amount of clay increases with depth. The parent material is expected to be clay.

Area No. 5. Ridge Moraine of Wisconsin Age

Several small areas are defined as coarse textured ridge moraine (Area No. 5). The northern one is located on both sides of Little Buck Creek east of Southport in Marion County. The others lie along the Big Blue River in Shelby County. Undulating to hummocky topography occurs. Surface drainage systems are absent in places and poorly developed in others.

A loam to a clay loam surface soil may be expected on the high position and a silt loam to a silty clay loam in the depressions. The subsoil varies from a clay loam to a clay. Stratified sand and gravel may be found at depth occasionally intermixed with clay loam and clay.

Area No. 6. Ridge Moraine of Wisconsin Age - Sandy-Texture

The sandy-textured ridge moraine deposits (Area No. 6) are concentrated in the region between Beech Grove of Marion County in the north to Greenwood of Johnson County in the south. Three small narrow ridges are found on the east bank of Sugar Creek in Johnson County. The topography of the sandy ridge moraine varies from undulating to hummocky.

However, many high and sharply defined eskers and kames are associated with this ridge moraine, particularly that lies east of Greenwood.

The surface texture varies from a sandy loam on the high topographic positions to a clay within the lows. A sandy clay loam to a clay subsoil may be encountered at a shallow depth. The parent material is generally of a sandy loam.

Area No. 7. Ridge Moraine of Wisconsin Age - Silt Loam Texture

The silt loam ridge moraine deposits occur south of Little Buck Creek in Marion County and in Shelby County. This deposit exhibits an undulating to rolling topography.

Silt loam or silty clay loam are the expected composition of the topsoil on the high topographic positions. A silty clay to a clayey subsoil is underlain by a loam to a clay loam parent material. In the low position, organic silt loam to organic clay may be found at the surface. The subsoils are essentially the same as in the high position.

Area No. 8. Thin Sand On Ridge Moraine

Near the border of Shelby and Bartholomew Counties east of the proposed route, there is an area designated as thin sand on ridge moraine (Area No. 8). The deposit is situated on the east bank of the huge outwash plain along the Big Blue River. The topography is hilly with sharp gullies in one place and infiltration depressions in the other.

On the high ground, a fine sandy loam or a silt loam may be found in the topsoil. A sand or a silty clay loam subsoil occurs and the parent material is composed of clay loam or clay. In the depressions an organic silt loam or organic clay is underlain by silty clay or clay

subsoil. The parent material is similar to the material found on the high topographic position.

Area No. 9. .Thin Loess on Ridge Moraine

Two regions along the route are mapped as a thin loess deposit on ridge moraines. One, about three miles long and less than one half mile wide, is located east of Edinburg. The other occurs on the southern tip of the study area. These are prominent ridges rising about 60 feet from the adjacent outwash or flood plain. Topography of this region varies from rolling to hilly.

The surface soil varies from a sandy loam to a silt loam. The subsoil may be loam or a silty clay loam. The lower portion of the subsoil contains a sandy clay texture and grades into a sandy loam or loam parent material.

In the depression the surface soil is moderately high in organic content. The texture of the topsoil ranges from an organic silt loam to an organic clay. The subsurface soils are silty clay to clay in texture with increasing plasticity with depth. The parent material is similar to that of Area 6.

Area No. 10. Sand Dune

The sand dunes are confined mostly in Bartholomew County near the southern tip of the study area. The most outstanding dune is located on the east bank of Driftwood River about one mile west of Taylorsville. Other dune areas lie about one mile south of the Shelby County border on the east side of the proposed route. The relief of this is much less than the one mentioned previously. Another narrow ridge of sand is found west of Sugar Creek less than a mile east of

Arity in Johnson County.

The topsoil of the sand dune deposit consists chiefly of a fine sandy loam. The subsoil is a slightly plastic clayey sand or loam. Uniform sands are found about 30 inches from the surface. The underlying glacial drift which has a loam to a clay loam texture may be encountered at depths of five or more feet except in the interdune area where the sand may be much lower.

Area No. 11. Gravelly Outwash Plain

The gravelly outwash plain occurs mainly along the major rivers. A large outwash plain is located along the White River. A large portion of the central business district surroundings of Indianapolis has been constructed on this outwash plain. Other large outwash plains are situated along Sugar Creek, Big Blue River and Driftwood River. Smaller deposits are found along Hurricane Creek near Franklin. The surface of these outwash plains is nearly level with a general slope to the south.

Sandy loam, loam, and silty loam are the expected textures of the topsoil of this deposit. The upper subsoil is a sandy clay loam or silty clay, and with increasing amount of gravel the lower subsoil may be a gravelly clay loam. Stratified gravel and sand may be found below about 24 inches.

Area No. 12. Sandy Outwash Plain

Sandy Outwash Plains occur in Johnson County west of Sugar Creek and in the vicinity of Southport in Marion County. In Johnson County a fairly large sandy outwash plain is located about one mile northeast of Arity. Others are scattered within a radius of one and one half

miles of Urmeyville. The topography of this deposit is nearly level. No surface drainage system is found on this deposit. Current scars and infiltration basins are absent from this area.

The surface soil as shown in soil profile No. 12 varies from a loam to a silty clay loam. With increasing plasticity the subsoil is a silty clay or a clay. The parent material found at a depth below 30 inches from the surface is a stratified sand and silt with a small amount of gravel and clay.

Area No. 13. Gravelly Outwash Plain, Organic

Numerous depressions in this study area are classified as organic gravelly outwash plains (Area No. 13). The largest one lies along Hurricane Creek northeast of Franklin. Another is located north of Arity. Many narrow and elongated deposits of organic material are found along the current scars on the huge outwash plain in the southern portion of the mapped area. A few isolated ones occur in Marion County. The surface topography of this deposit is an extremely flat depression.

Organic silty clay or organic clay is the texture of the topsoil. It is underlain at various depths by a gravelly clay, a silty clay or a clay. Clean, stratified sand and gravel is the parent material found at a depth below 30 inches.

Area No. 14. Sandy Outwash Plain, Organic

This deposit is associated with the sandy outwash plain mapped as Area 12. It can be considered as the topographic depression of the sandy outwash plain. The topography is extremely level and is only slightly lower than the sandy outwash plain.

Organic silty clay or organic clay is the inferred topsoil. The

subsoil is a plastic clay and the parent material is a stratified sand and silt with little gravel and clay.

Area No. 15. Lacustrine Terrace

In the extreme southern portion of the study area there are some areas classified as lacustrine terrace. These deposits are related to the Illinoian glacial period. The surface of this deposit is undulating as it has been dissected by subsequent erosion. The topsoil as well as the subsoil varies from a sandy loam to a clay loam and from a sandy clay loam to a clay respectively. The lower horizons consist of silty clay mixed with some sand and gravel. The parent material varies from a stratified sand and silt with some clay to a stratified silt and clay with some sand.

Area No. 16. Terrace

Several isolated stream terrace deposits are mapped in this study. Most of them are located along the northwest bank of the Big Blue River and the west bank of Driftwood River. Some smaller ones are along Youngs Creek, Little Buck Creek and White River south of Pleasant Run. The stream terraces are nearly level. Local relief difference is due mainly to the formation of current scars and infiltration basins.

The composition of the soil profile varies greatly in the surface and subsurface layers. Sandy loam, loam, silt loam, clay loam and silty clay loam may be found in the topsoil. Varying amounts of organic matter may be present. The subsoil may consist of a sandy clay loam, a gravelly clay loam, a clay loam, a silty clay or even a clay. The parent material, however, is expected to be clean stratified sand and gravel on the terraces along the major stream and a stratified silt and sand along the minor

drainage channels. In the low topographic position an organic loam to an organic clay topsoil overlies a silt loam to a clay subsurface soil. Gravelly clay loam and clay are the texture of the subsoil and the parent materials are as described before.

Area No. 17. Flood Plains.

Along the major rivers or streams in this study area there are wide flood plains. Many of the flood plains are almost a mile in width. These flood plains are associated with the outwash plains; therefore, the substrata are stratified sands and gravel as previously described for Areas 11 and 12. Flood plains along White River, Sugar Creek, Big Blue River, Driftwood River and Youngs Creek can be classified in this category. The flood plain deposit generally show a gently undulating surface sloping gently downstream. Current markings are noticable along the larger streams.

The texture of the alluvial deposits varies greatly from one place to the other depending on the nature of the drainage basin. The topsoil ranges from a sandy loam to an organic silt loam as indicated on soil profile No. 17. The subsoil is usually a silt or a silty clay loam interbedded with sand lenses in places. Stratified sand, silt and silty clay may be encountered above the clean, stratified, sand and gravel outwash. In the low topographic positions the texture of the surface and subsurface soils are finer than those on the high positions. Loam or silt loam surface soil is underlain by a silt loam or a silty clay. The parent material is a stratified sand and gravel with some fines.

Area No. 18. Alluvial Plains Along Small Tributaries

All the drainage channels of the tributaries of the major rivers possess recent alluvial plains. The difference between this deposit and the previous one (Area No. 17) is that this alluvial soil is derived from the local glacial drift. The alluvial plain in this region is usually narrow and slopes more steeply down stream. Current markings are absent.

The topsoil varies from a loam to a silty clay loam. Silt loam, silty clay loam and clay may be found in the subsoil layer. A stratified sand, silt and clay deposit is reached at a shallow depth. Beneath the alluvial deposit a loam or a clay loam glacial till is found over most of the area; however, interbedded sandstone and shale may be found in the area (Area No. 3) at the southwestern tip of the strip map.

Area No. 19. Organic Depressions

Many basins in the study area are mapped as organic depressions. They are the result of accumulation of organic matter in poorly drained topographic positions. The majority of these areas occur in the ridge moraine or ground moraine areas.

The soil profile consists of an organic silty clay or an organic clay topsoil underlain by a clay loam or a clay subsoil and the parent material associated with the surrounding landform.

Area No. 20. Eskers and Kames

Several eskers and kames occur in this study area. Most of them are scattered in the ground moraine region. However, a concentration of eskers and kames is located along the ridge moraine east of Greenwood in Johnson County. Some of the eskers and kames are high above the surrounding ground (one within Crown Hill Cemetery is about 100 feet

high). Most of the eskers and kames, however, are low in magnitude and range from about 10 to 30 feet high. For easy identification, these deposits are outlined on the strip maps with dotted lines.

The soils developed on eskers and kames vary considerably. The surface horizon is a loam or a silty clay loam. In zones of severe slope erosion, the surface soil may be entirely removed and the subsoil exposed. The subsoil is expected to be a sandy clay or a gravelly clay. The amount of sand and gravel increases very rapidly with depth. Clean, stratified, coarse outwash material may be found in the parent material zone. However, in some areas, especially those in the vicinity of Franklin, sand may predominate. In others pseudokames and pseudoeskers, particularly a group of five located about three miles east of Southport in Marion County, contain a loam or a clay loam till parent material (2).

Area No. 21. Muck and Peat Basins

Only a few muck and peat basins are recognized in this study area. All of them are located along Sugar Creek in Johnson County. The depth of these organic deposits varies from one deposit to the other.

SUMMARY

The proposed route starts at the intersection with U.S. 52 northwest of Indianapolis. Approximately 70 percent of the first five miles is on a silt loam ground moraine (Area 1). Within this section the route crosses, at three points, the narrow flood plain of Little Eagle Creek and also the flood plain of Crooked Creek. These flood plains are underlain by till at a shallow depth. Just west of Crooked Creek a small area of a slightly more sandy textured ground moraine (Area 2) is encountered. The route also crosses, in an east northeast direction, the flood plain

of White River. The flood plain is about 2,5 0 feet wide and contains stratified material of variable densities and strength. On the east side of the valley the route traverses the silt loam ground moraine for about a mile. The route then crosses an extensive area about three and one half miles wide that is an outwash plain (Area 11). The flood plain of Fall Creek bisects this large outwash plain. Coarse-textured fluvial drift occurs in the outwash and flood plain deposits along this section.

The proposed route reenters a silt loam ground moraine near U.S. 40 and traverses this ground moraine for about six and one half miles. Within this zone the route crosses the narrow flood plains of Bean Creek and Lick Creek and a small area of slightly more sandy textured ground moraine just south of Lick Creek. A sandy-textured ridge moraine (Area 6)is then encountered north of Little Buck Creek andeast of Southport.

A few somewhat sandy-textured ground moraine (Area 2) are scattered along the huge silt loam ground moraine (Area 1) south of Little Buck Creek in the southern part of Marion County. The route, after changing to a course due south about one mile from the crossing of Little Buck Creek, traverses alternately on the silt loam (Area 1) and the slightly sandy-textured ground moraine (Area 2). This region from U.S. 40 to the Marion-Johnson County line contains a very unifrom material and surface configuration.

A sandy-textured ridge moraine (Area 6) is reached about one mile south of the Marion County line. Several eskers and kames (Area 20) occur near the alignment throughout this ridge moraine. The route crosses a kame on the edge of the sandy-textured ridge moraine (Area 6) and enters the silt loam ground moraine (Area 1) again. A small organic depression

(Area 19) is expected and mapped immediately south of the ridge moraine just mentioned. The proposed route traverses the silt loam ground moraine for about 11 miles with only an esker (Area 20) and a valley breaking the surface expression of a gently undulating plain. The valley is along Hurricane Creek and this outwash deposit (Area 13) is organic on the surface and to a shallow depth.

The route, southeast of Franklin, encounters a silt loam ridge moraine (Area 7), a narrow organic outwash deposit (Area 13), a sandy outwash deposit (Area 12) and a gravelly outwash deposit (Area 11) before crossing the flood plain (Area 17) of Sugar Creek. This complex of outwash plains and flood plains continues for approximately ten miles. These fluvial deposits are bifurcated by the flood plains of Sugar Creek, Big Blue River and Driftwood River. Coarse-textured materials are expected throughout this region. Many of these outwash surfaces would be flooded during major floods on this river systems.

Southeast of Edinburg and within Bartholomew County the route traverses a ridge moraine (Area 9) that has a surficial deposit of loess. This eolian deposit occurs along a route distance of about one mile. Within this zone a small portion of a lake terrace deposit (Area 15) and an organic outwash deposit (Area 13) is encountered between the segments of the outwash plain (Area 11) in Shelby and Bartholomew Counties.

Just north of the terminus of the route on the edge of the flood plain along Driftwood River, the alignment crosses an area of sand dunes (Area 10) and another segment of a ridge moraine (Area 9) covered with loess. The loess is expected to be thin and therefore would require no special slope design. Soil slumps should be expected in those soil areas

indicated as Area 9.

Approximately 15 miles or one third of the proposed route traverses coarse-textured deposits of glacial-fluvial or fluvial origin. The remainder traverses fine-textured material of glacial origin. Most of this glacial drift is of ground moraine type with a few ridge moraines that may contain local stratified deposits in isolated kames and eskers. Materials of construction should be plentiful in the major outwash plains at both the north and south sections of the project. Drainage of roadway areas will be a major problem throughout the section of road located on the ground moraines.

ACKNOWLEDGEMENT

All airphoto used in connection with the preparation of this report automatically carry the following credit lines: "photographed for United States Department of Agriculture."

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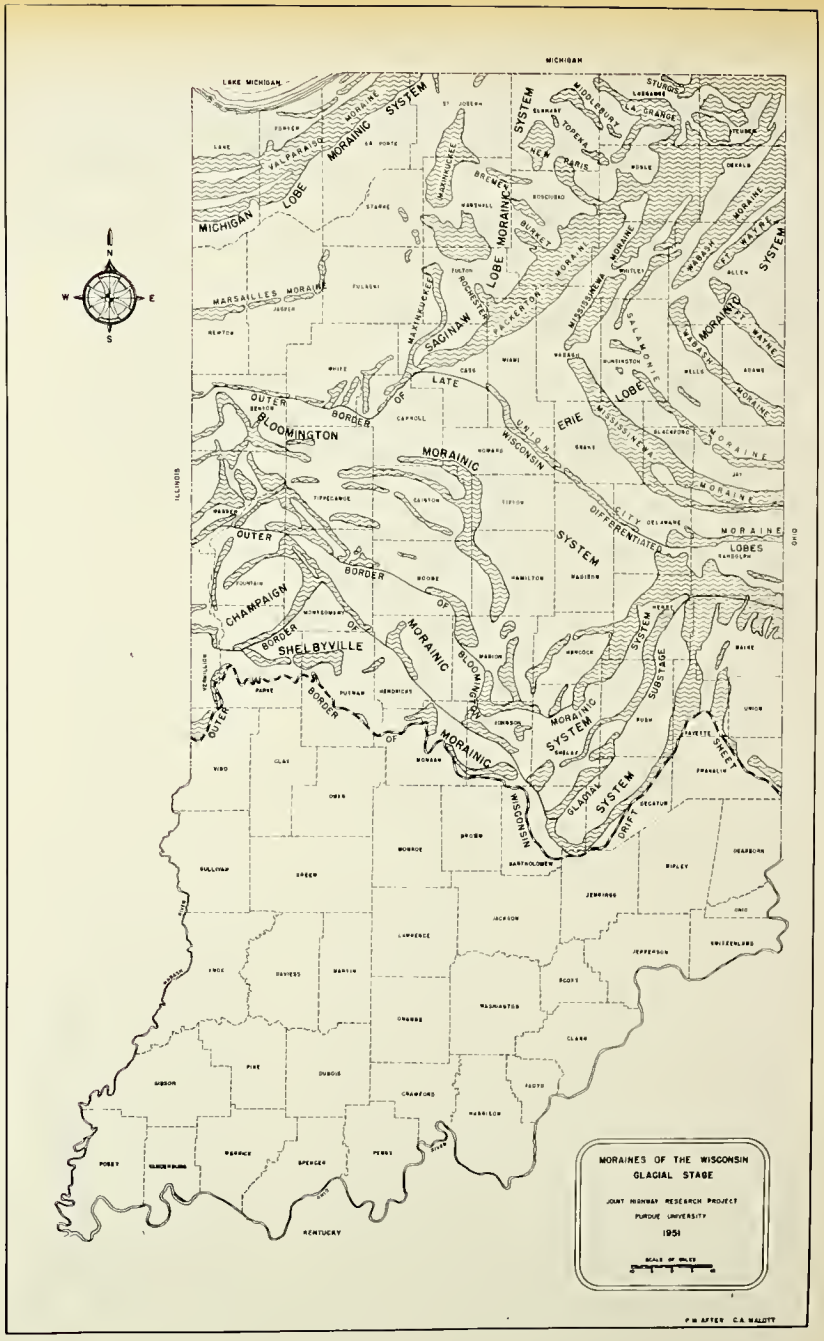
8. Woods, K. B., Editor-in-chief, Highway Engineering Handbook, McGraw-Hill Book Company, New York, N. Y., 1960.

SOIL CLASSIFICATION AND PROFILE SYMBOLS

Description	Grain Size Distribution				Plastic Index	Symbol
	Gravel % Retained on #10	Sand #10–#200	Silt 0.05–0.005mm	Clay less than 0.005mm		
Gravel	85–100	0–15	0–10	0–10	NP	
Sandy Gravel	50–85	15–50	0–10	0–10	6 Max.	
Sand	0–15	85–100	0–10	0–10	NP	
Gravelly Sand	20–49	45–85	0–10	0–10	6 Max.	
Sandy Loam	0–19	50–80	0–50	0–20	6 Max.	
Sandy Clay Loam	0–19	50–80	0–30	20–30	10 Max.	
Sandy Clay	0–19	55–70	0–15	30–45	11 Min.	
Loam	0–19	30–50	30–50	0–20	10 Max.	
Silt Loam	0–19	0–50	50–100	0–20	10 Max.	
Silty Clay Loam	0–19	0–30	70–100	20–30	11 Min.	
Silty Clay	0–19	0–15	55–70	30–45	11 Min.	
Clay Loam	0–19	20–50	50–80	20–30	11 Min.	
Clay	0–19	0–55	0–55	30–100	11 Min.	
Peat or Muck						
Limestone						
Sandstone						
Shale						
Stony Fragments						
Organic Matter						
Topsoil						

Classification of Gravelly Soils

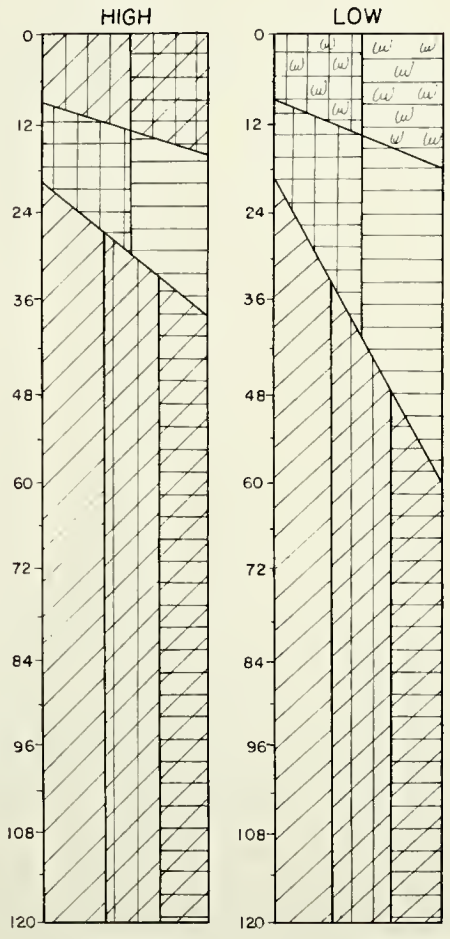
85%–100% gravel plus finer material – Gravel
50%–84% gravel plus finer material – Clayey, silty or sandy gravel
20%–49% gravel plus finer material – Use fine classification and called gravelly sand, gravelly silt or gravelly clay
0%–19% gravel plus finer material – Use fine classification only



GENERAL SOIL PROFILES

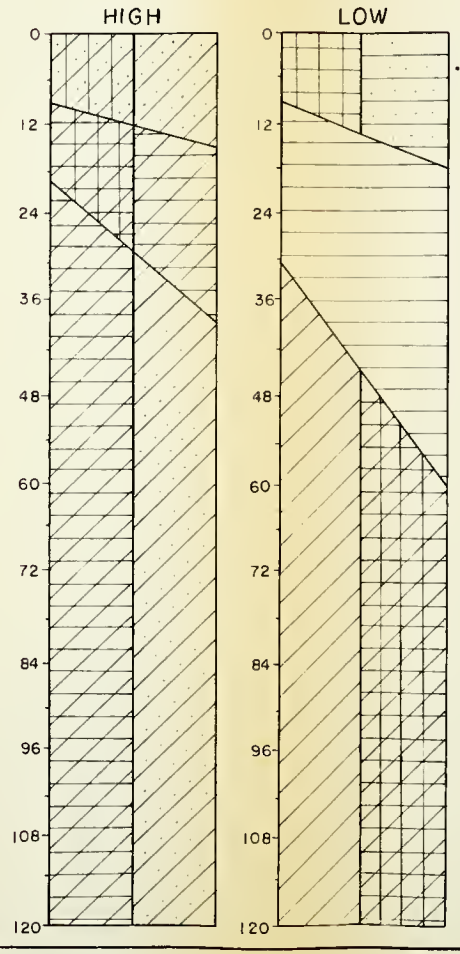
PROFILE NO. 1

GROUND MORAINE DEPOSIT



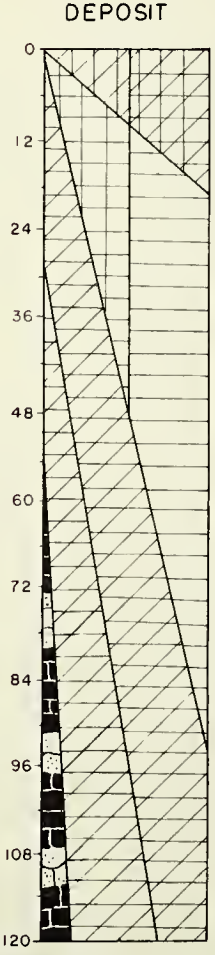
PROFILE NO. 2

GROUND MORAINE DEPOSIT



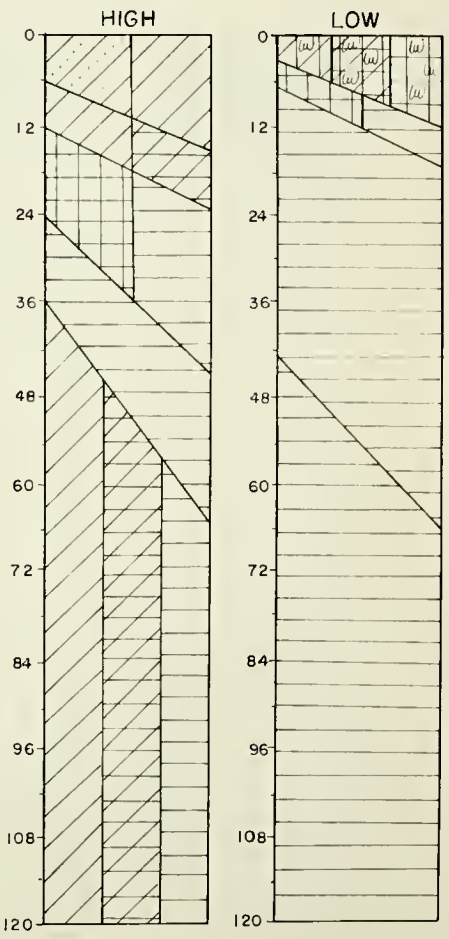
PROFILE NO. 3

GROUND MORAINE DEPOSIT



PROFILE NO. 4

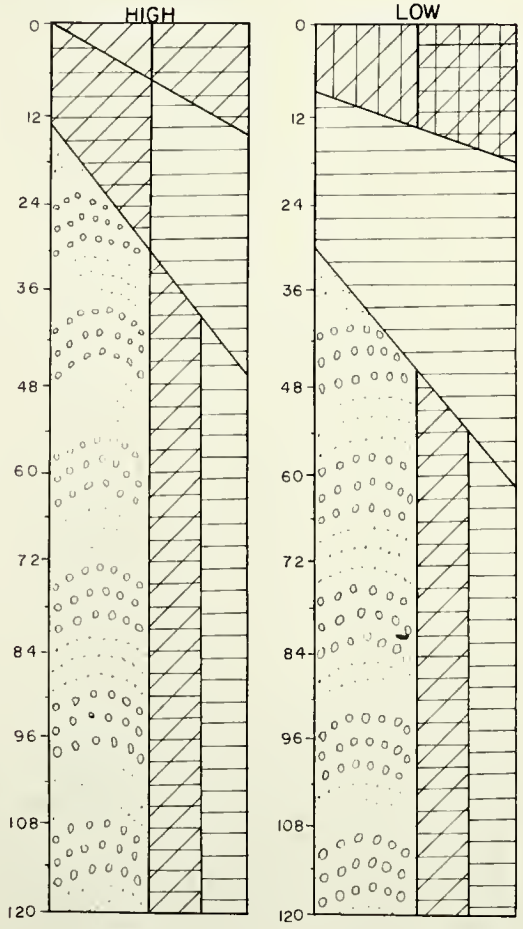
GROUND MORAINE DEPOSIT



GENERAL SOIL PROFILES

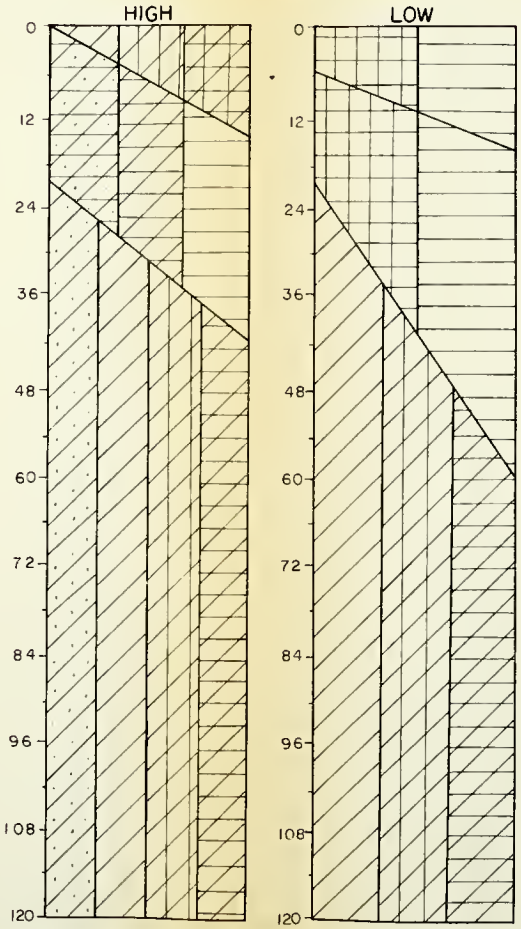
PROFILE NO. 5

RIDGE MORAINE DEPOSIT



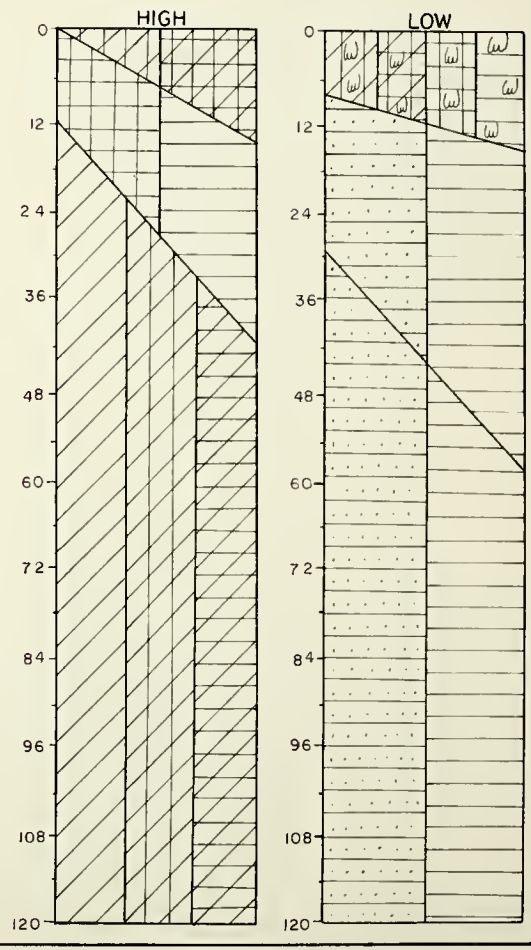
PROFILE NO. 6

RIDGE MORAINE DEPOSIT



PROFILE NO. 7

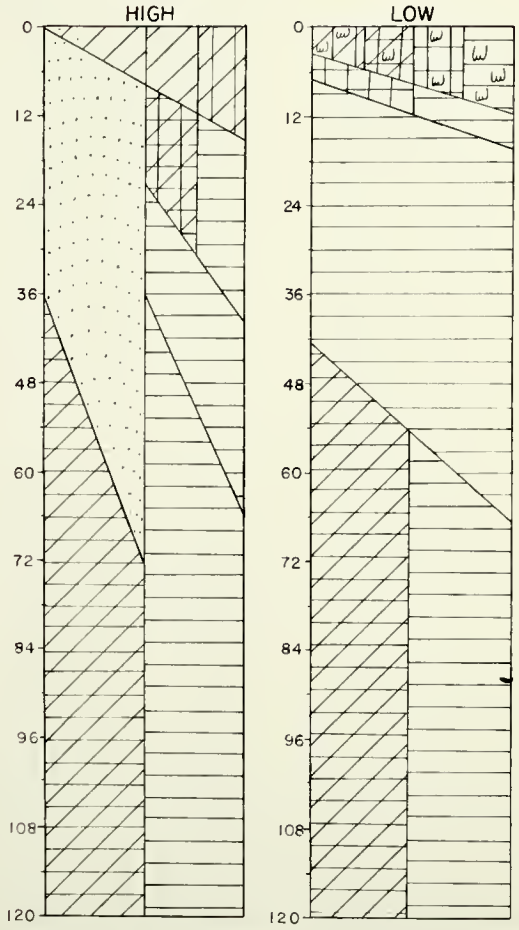
RIDGE MORAINE DEPOSIT



GENERAL SOIL PROFILES

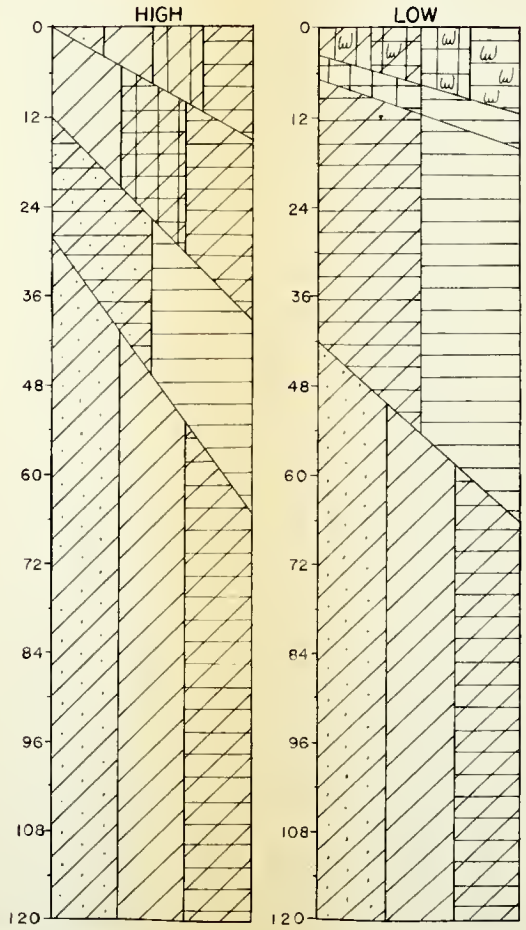
PROFILE NO. 8

RIDGE MORAINE DEPOSIT



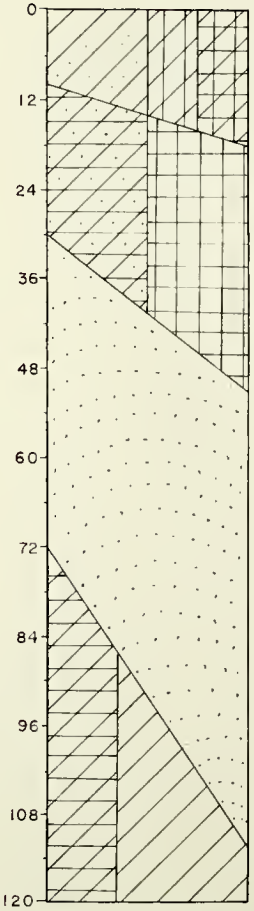
PROFILE NO. 9

RIDGE MORAINE DEPOSIT



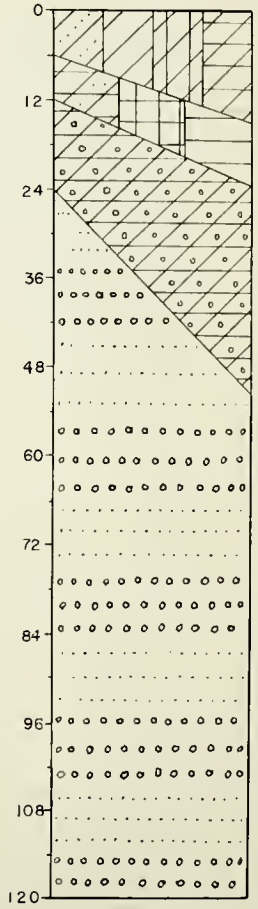
PROFILE NO. 10

SAND DUNE DEPOSIT



PROFILE NO. 11

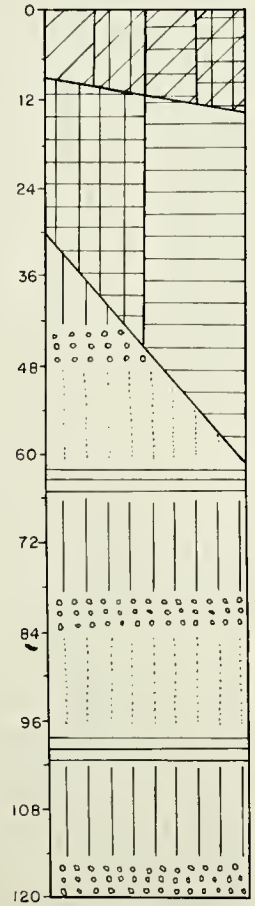
OUTWASH DEPOSIT



GENERAL SOIL PROFILES

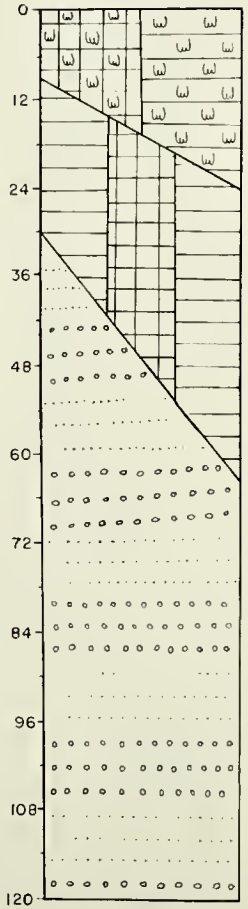
PROFILE NO.12

OUTWASH DEPOSIT



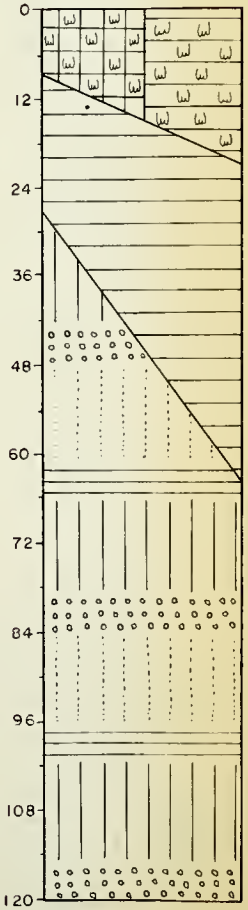
PROFILE NO. 13

OUTWASH DEPOSIT



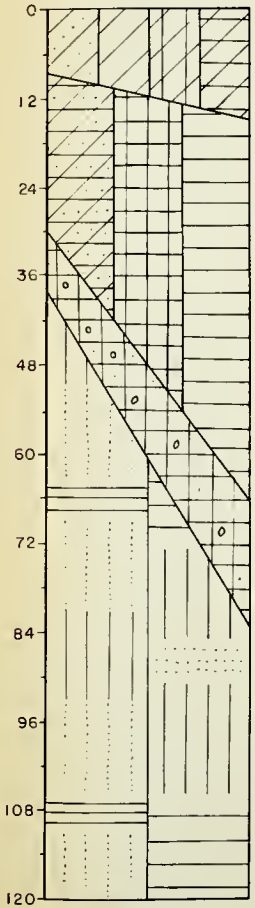
PROFILE NO. 14

OUTWASH DEPOSIT



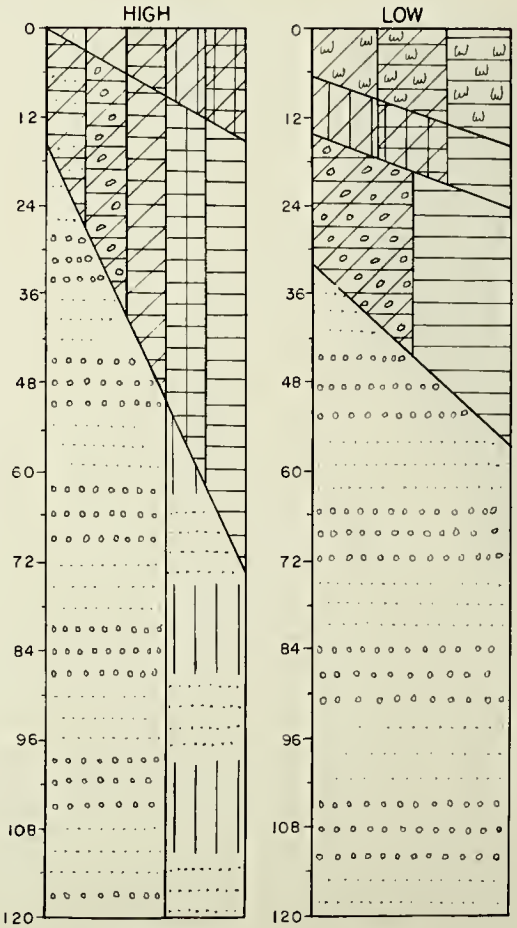
PROFILE NO. 15

LAKE TERRACE DEPOSIT

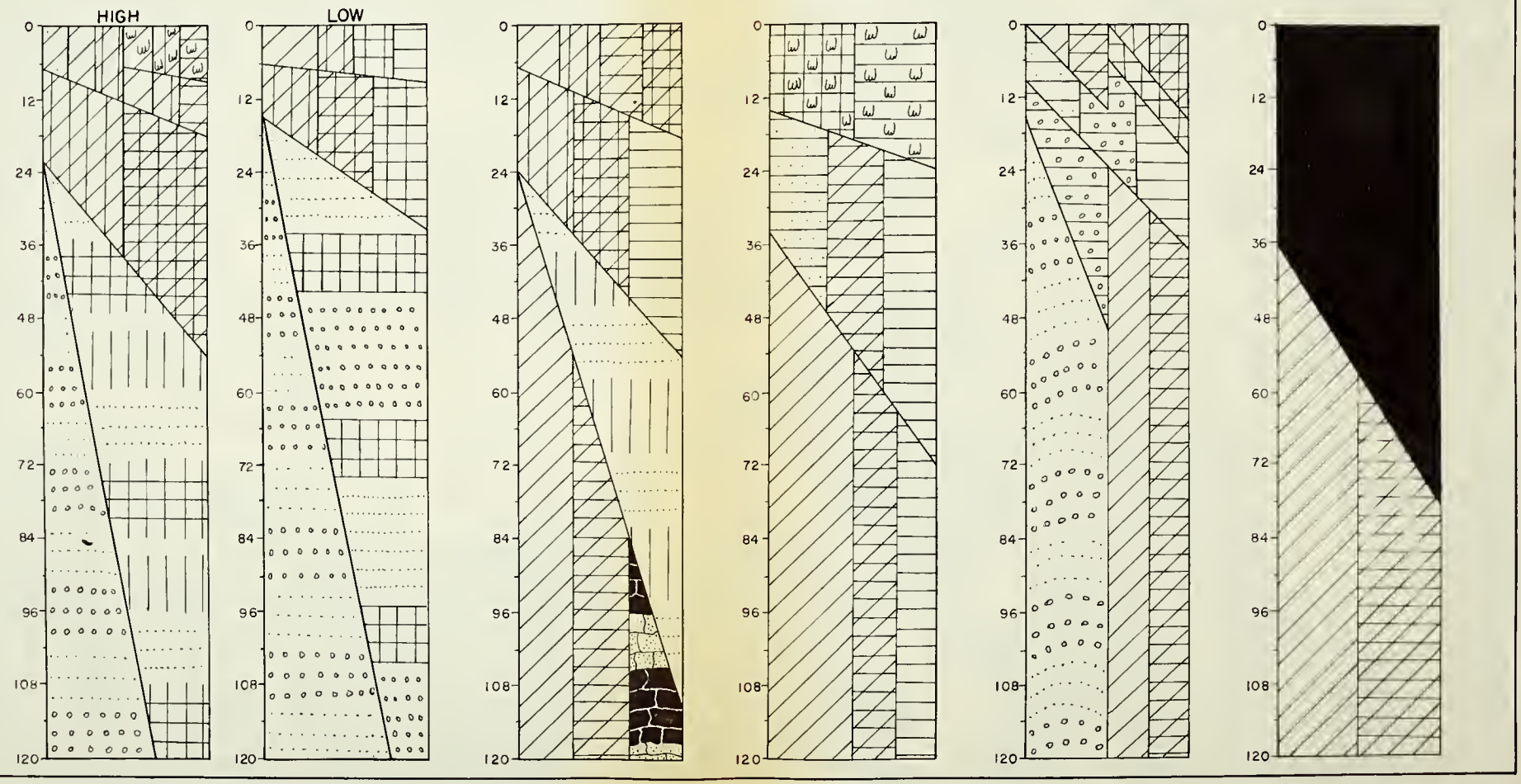


PROFILE NO. 16

STREAM TERRACE DEPOSIT



GENERAL SOIL PROFILES




1B-62
Spring Hills
U.S. 421
WHITE RIVER
Shooters Hill
Woodstock
Gravel pit
Crooked Cr.
State Fish Hatchery
Lake
WHITE RIVER
Little Eagle Cr.
1B-64
U.S. 52
U.S. 52
Little Eagle Cr.


SR 37
SR 67
U.S. 36
SR 67
FALL CREEK
U.S. 31
U.S. 421
U.S. 421
Gravel pit
INDIANAPOLIS
Monument Circle
U.S. 52
U.S. 36
U.S. 40
U.S. 421
Postues Run


U.S. 421
U.S. 40
U.S. 52
New York Central R.R.
BEECH GROVE
Lick Cr.
Indianapolis Union R. R.
PLEASANT RUN
Bean Cr.
Gravel pit
pond
U.S. 421
EL 1B 12
Pennsylvania R.R.
SR 431
U.S. 31
Lick Cr.
gravel pit
36


Little Buck Cr.
Little Buck Cr.
Edgewood
Pennsylvania R.R.
Southport
SR 431


Grubbs D.
Heck D.
MARION CO.
JOHNSON CO.
Gregg D.
GREENWOOD
Pennsylvania R.R.
pond


Heck D.
Hurricane Cr.
pond
pond
pond
Whiteland


Cleveland Cincinnati Chicago and St. Louis R.R.
SR 44
Hurricane Cr.
FRANKLIN


SUGAR CREEK
SHELBY CO.
JOHNSON CO.
Ryker D.
TB-17C
TB-17B
CONFIDENTIAL
SUGAR CREEK
Pennsylvania R.R.
U.S. 31
Amity
Youngs Creek

BIG BLUE RIVER
SR 252
SHELBY CO.
JOHNSON CO.
Gravel pit
Gravel pit
SR 252
pond
EDINBURG
BARTHOLOMEW CO.
FO - 1B - 1N - 0
CONFIDENTIAL


Taylorsville
U.S. 31
Pennsylvania R.R.
BARTHOLOMEW CO.
Gravel pit
EDINBURG
U.S. 31
DRIFTWOOD RIVER
CONFIDENTIAL
CONFIDENTIAL
CONFIDENTIAL

L-60